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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/781,931	02/12/2001	James R. Fincke	B-026	1785

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EXAMINER	
STRICKLAND, JONAS N	

ART UNIT	PAPER NUMBER
1754	

DATE MAILED: 12/29/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/781,931	FINCKE ET AL.	
	Examiner	Art Unit	
	Jonas N. Strickland	1754	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 October 2003*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18, 33-37, 39, 40, and 42-61* is/are pending in the application.

4a) Of the above claim(s) *47-49,51-55 and 61* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18, 33-37, 39, 40, 42-46, 50, and 56-60* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Response to Amendment

1. This Detailed Action is in response to the amendment filed on 10/01/2003. Claims 19, 38, and 41 have been cancelled without prejudice or disclaimer. Claims 1, 5-18, 33-37, 39, 40, 42-46, 50, and 58 have been amended herein and no new matter has been added to the currently pending claims. The previous rejections under 35 U.S.C. 102(b) and 35 U.S.C. 103(a) have been withdrawn in view of Applicant's amendments to the instantly claimed invention. Furthermore, the claim objection to claim 16 has been withdrawn in view of Applicant's amendment.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-3, 5-10, 12-16, 18, 33, 34, 36, 44-46, 50 and 58-60 are rejected under 35 U.S.C. 103(a) as being unpatentable over Anderson (US Patent 3,051,639) in view of Davis et al. (US Patent 3,954,954).

Applicant claims a method of converting one or more reactants to a desired end product, comprising: introducing a reactant stream at one end of an axial reactor; heating the reactant stream as the reactant stream flows axially through an injection line and thoroughly mixing the reactant stream with a heating gas within the injection line; passing the thoroughly mixed reactant stream axially from the injection line to a reactor

chamber; maintaining a volume defined by the reactor chamber at a substantially uniform temperature as the thoroughly mixed reactant stream passes there through; and producing a desired end product stream at a location adjacent an outlet end of the axial reactor.

Anderson discloses an arc torch chemical reactor, which relates to chemical reactions promoted by energy from a wall-stabilized electric arc. More particularly the process relates to an improved process and apparatus for the production of acetylene from methane, which employs a gas stream comprised of hydrogen. The reactant stream is passed through an axial reactor and mixed with a heating gas (see Figs. 1-3 and col. 4, lines 38-70). The temperature is maintained at 5000 K, which is a uniform temperature over the length of the reaction zone (col. 5, lines 40-42). Anderson continues to disclose wherein the reactor comprises an insulating layer comprised of carbon, as well as zirconia (col. 5, lines 1-6). However, Anderson does not disclose thoroughly mixing the reactant stream with a heating gas within the injection line.

Davis et al. teaches a process of carrying out high temperature, chemical reactions, including reductions for producing elemental metal powders using a plasma generator (see abstract). Davis et al. continues to disclose wherein the stabilizer gas (the heating gas), which is used to generate the plasma may also comprise a reactant gas (col. 5, lines 23-27). Davis et al. continues to disclose wherein the feed gas and the reactant gas are carried by the plasma into an axially extending reaction member (within an injection line; col. 5, lines 31-38). Davis et al. teaches wherein a plasma reactor may be maintained between a temperature range of 1800°K to 5000°K.

Therefore, it would have been obvious to one of ordinary skill in the art to modify the teachings of Anderson based on the teachings of Davis et al. by thoroughly mixing a reactant stream with a heating gas within an injection line. Anderson teaches wherein the reactant stream is passed through an axial reactor and mixed with a heating gas, but Davis et al. teaches wherein the stabilizer gas (the heating gas), which is used to generate the plasma may also comprise a reactant gas (col. 5, lines 23-27). Davis et al. continues to disclose wherein the feed gas and the reactant gas are carried by the plasma into an axially extending reaction member. One of ordinary skill in the art would have been motivated to combine the cited references, because Anderson and Davis et al., both teach processes for converting one or more reactants to a desired end product.

With respect to claim 3, Anderson teaches hydrogen may be a product, and having a methane reactant entering the reaction zone (col. 5, lines 31-55). Davis et al. teaches wherein the product may be metal, such as tantalum, tungsten and metal halides.

With respect to claim 18, it would have been obvious to one of ordinary skill in the art to produce a turbulent flow of at least one reactant and the plasma within the injection line, since Davis et al. teaches wherein the stabilizer gas (the heating gas), which is used to generate the plasma may also comprise a reactant gas. It would be expected for a turbulent flow to occur.

With respect to a uniform temperature, Anderson clearly discloses maintaining a temperature of 5000 K for the effluent gas stream. By maintaining a temperature of 5000 K, the temperature is uniform.

4. Claims 4, 11, 35, 56, and 57 are rejected under 35 U.S.C. 103(a) as being unpatentable over Anderson (US Patent 3,051,639) in view of Davis et al. (US Patent 3,954,954) as applied to claims 1-3, 5-10, 12-16, 18, 33, 34, 36, 44-46, 50 and 58-60 above, and further in view of Davis et al. (US Patent 4,335,080), Drouet et al. (US Patent 5,017,754), and McLaughlin (US Patent 3,429,691).

Applicant claims with respect to claim 4, wherein the reactant stream comprises a titanium compound and the desired end product comprises titanium or titanium dioxide.

Anderson discloses a method of converting one or more reactants to a desired product having an axial plasma reactor, with a uniform temperature over the length of a reaction zone. Davis et al. teaches wherein the product may be metal, such as tantalum, tungsten and metal halides. However, Anderson and Davis et al. do not disclose wherein the disclosed method may be used for producing titanium or titanium dioxide.

Davis et al. '080 teaches a plasma apparatus, which may be used for producing titanium dioxide (col. 1, lines 50-59).

McLaughlin teaches wherein titanium dioxide may be produced by using a mixture comprised of titanium tetrachloride and oxygen (col. 1, lines 15-47).

Drouet et al. also teaches wherein a plasma reactor may be used for the benefication of titaniferous ores and in gas purification and arc starters (col. 7, lines 3-15).

Therefore, it would have been obvious to one of ordinary skill in the art to modify the teachings of Anderson, which teaches an arc plasma system for producing desired end products based on the teachings of Davis et al., McLaughlin and Drouet et al., which teach wherein a titanium dioxide product may be obtained from a plasma arc system, as well as wherein a gas purification process may also be used by a plasma reactor. Such modification would have been obvious because one of ordinary skill in the art would expect a method for producing desired products from a plasma reactor as taught by Davis et al., McLaughlin, and Drouet et al. to be similarly useful and applicable to the plasma process and apparatus for producing desired end product as taught by Anderson. The instantly claimed invention is only directed towards a process for producing end products and the cited prior art references are directed towards chemical processes, which are used for producing desired end products, such as titanium dioxide and acetylene, and hydrogen.

5. Claims 17, 37, 39, 40, 42, and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Anderson (US Patent 3,051,639) in view of Davis et al. (US Patent 3,954,954) as applied to claims 1-3, 5-10, 12-16, 18, 33, 34, 36, 44-46, 50 and 58-60 above, and further in view of McFeaters et al. ("Application of Nonequilibrium Gas-Dynamic Techniques to the Plasma Synthesis of Ceramic Powders").

Applicant claims with respect to claims 17, 37, 39, 40, 42, and 43 having convergent-divergent nozzles. The teachings of Anderson and Davis et al. have been discussed with respect to a method for producing desired end products, such as

acetylene and titanium dioxide using a plasma reactor. However, the teachings of Anderson and Davis et al. do not teach having a coaxial convergent-divergent nozzle.

McFeaters et al. teaches wherein plasma reactors exhibit improved advantages in obtaining the desired end product using converging and diverging nozzles (see p. 433-434). McFeaters also teaches wherein the product cools quickly using the converging and diverging nozzles.

Therefore, it would have been obvious to one of ordinary skill in the art to use converging and diverging nozzles in a plasma reactor, based on the teachings of McFeaters et al., which teaches wherein high cooling rates are achieved using converging and diverging nozzles in a process utilized in a plasma reactor. Such modification would have been obvious to one of ordinary skill in the, art, since McFeaters et al, as well as Anderson and Davis et al. are all directed towards a process for producing desired end products using a plasma reactor.

Response to Arguments

6. Applicant's arguments with respect to claims 1-18, 33-37, 39, 40, 42-46, 50, and 56-60 have been considered but are moot in view of the new ground(s) of rejection.

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonas N. Strickland whose telephone number is 703-306-5692. The examiner can normally be reached on M-TH, 7:30-5:00, off 1st Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on 703-308-3837. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-0661.

STANLEY S. SILVERMAN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700

Jonas N. Strickland
December 22, 2003